Fact Sheet

US Army Engineer
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Waterways Experiment Station

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Subsurface Site Characterization

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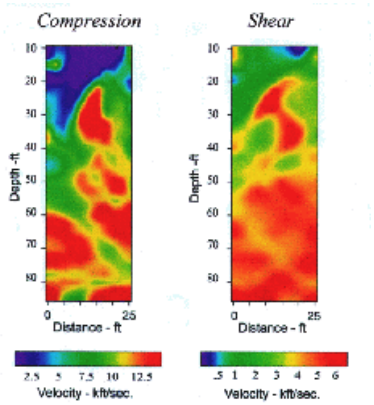
Purpose: Summarize Development of Seismic Tomographic Site Characterization Procedures

Facts:

The primary objective of efforts to advance site characterization methods is to improve the Corps' ability to predict the performance of a large structure under seismic loads and to design and construct cost-effective remediation if such is necessary. A secondary objective is to adapt these innovative procedures for application to other types of site definition problems such as: anomalous geologic features, faults, cavities, weathered zones, site stratigraphy, and direct measurement of dynamic properties.



Boreholes A & B

Success Dam Tomography
(Note anomalous zone at 55ft depth)

Efforts to develop new geophysical test procedures target significant reductions in site characterization costs while providing more information. The following rationale was used to structure an approach to the problem's solution:

- Broad areal site coverage is more representative of true site conditions than discrete data points obtained through borings or push probes. Hence, devise a method to increase site coverage.
- The entire seismic wave train is affected by numerous definable site parameters. Therefore, explore use of seismic tomography to better define site factors.
- The relationship between seismic wave train modification and earthquake susceptibility can be established. Hence, adapt geophysical theory to determine engineering parameters in situ.
- Application of the Biot theory suggests more accurate and economical site characterization. Since the Biot theory is valid only for use in saturated materials, consider it as a primary tool for determining engineering parameters related to liquefaction.

Conconully Dam, WA

Field sites were chosen and prioritized as the result of an interdisciplinary workshop conducted at WES in January 1996. Geophysical tests were successfully completed at Success Dam, CA, during the summer of 1996. Further development of new methods occurred at Conconully and Salmon Lake Dams, WA (BuRec dams) in May-June 1997. Areal site coverage was extended from 15 ft between boreholes to 215 ft by combining vertical seismic profiling and crosshole tomographic techniques. Waterborne acoustic impedance tests were performed at Arkabutla Reservoir during March 1999. Major changes in field data acquisition and processing procedures are forthcoming. The work described herein was funded by the Earthquake Engineering Research Program.